102 — 100

106

104 —

Figure A1

102 — 100

106

104 — 108

Figure A2

102 — 100

106

104 —

Figure A3

122 ⟶ 120

124

126

128

**Figure B1**

122 ⟶ 120

124

126

128

130

**Figure B2**

122 ⟶ 120

124

126
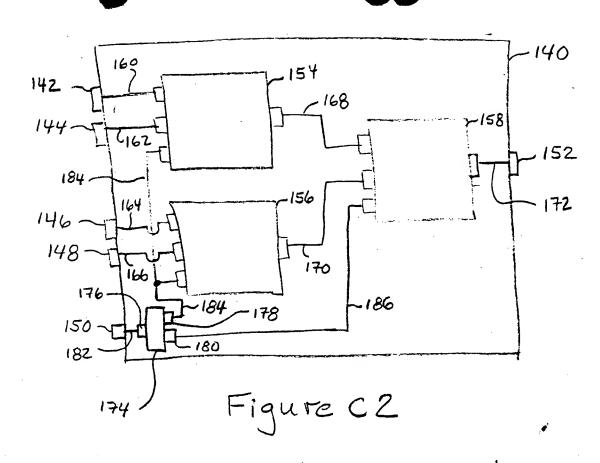
128

132

**Figure B3**

142 — 
144 — 
146 — 
148 — 
150 — 
140
152

Figure C1

Figure C2

Figure C3

Figure D1
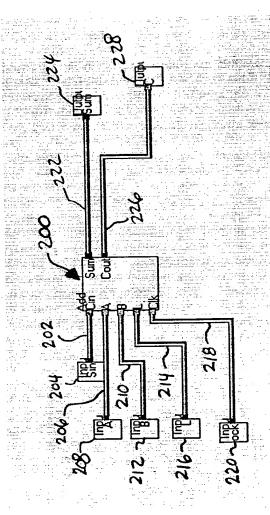
Figure D2

Figure D3

Figure D4

Figure D5

Figure D6

Figure D7

Figure D8

310

328

318 312

VE

324

320

314

330

VE

316

VC

326

322

+

+

Figure D9

Figure D10

490

CAST

492

494

496

Figure E1A

490

Cast
(top-level)

400

Cast
(Variant)

Figure E1B

Figure E1

CAST (in general)

418

402

434

436

432

428

420

424

412-1

430

426

USB side

USB side

Figure E2

420

412-2
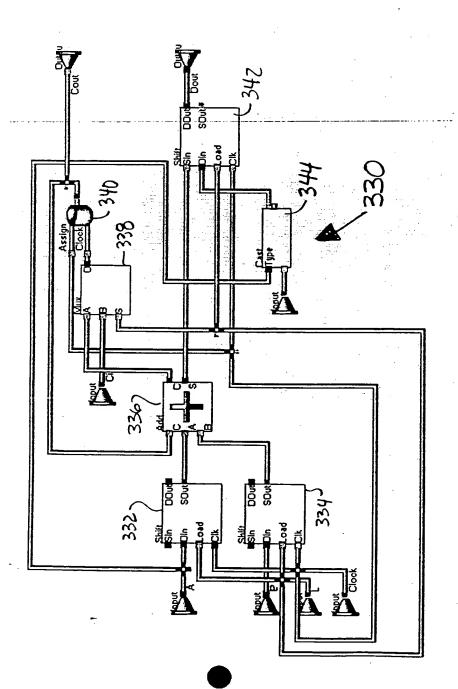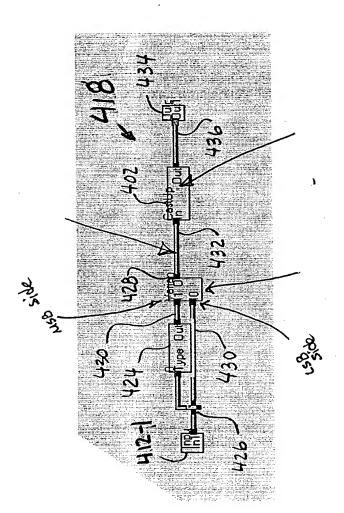
416-2
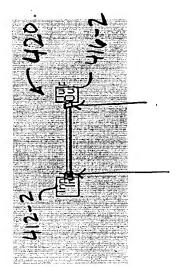
Figure E3

Figure E4

Figure E5

Figure E6

Figure E7

Figure E8

Castup
(top-level    402

Castup
(Explicit-
64-bit)    420

Castup
(Variant)    418

Figure E9

Invert
(top-level    — 500

502 ~ Invert          Invert   ~ 504
     (Variant)       (atomic)

Figure F1

                                  500
506 ~ ⊳○          508

Figure F2

        514    500 ~              518        502
410                                          512
(iV)                                    
        516                      520
        500

Figure F3

                        522
(Bit) ▷□      ▷○  ◁ (Bit)
526    524        528      530

Figure F4

532   506   500   508   536

534   540   542   544   546   550   538
548

Figure F5

4bits   514'   2bits   500   502

532   510'   512   536   538

534   532   516'   2bits   518

500   520   546

Figure F'6

Figure F7

Figure F8

exposer   Collector

Bit (1-bit)          —          —

Dbit (2-bits)   Dbit ⊣|Dbit|⊢ bit / bit     bit / bit ⊣|Dbit|⊢ Dbit

Nibble (4-bits)   Nibble ⊣|Nib.|⊢ Dbit / Dbit     Dbit / Dbit ⊣|Nib.|⊢ Nibble
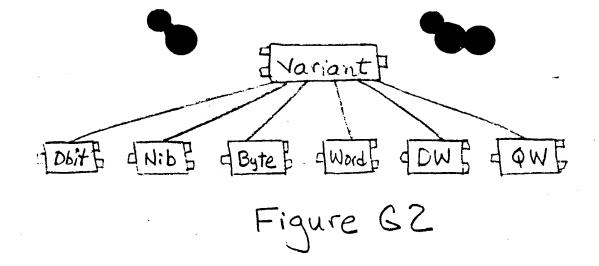
Byte (8-bits)   Byte ⊣|Byte|⊢ Nibble / Nibble     Nibble / Nibble ⊣|Byte|⊢ Byte
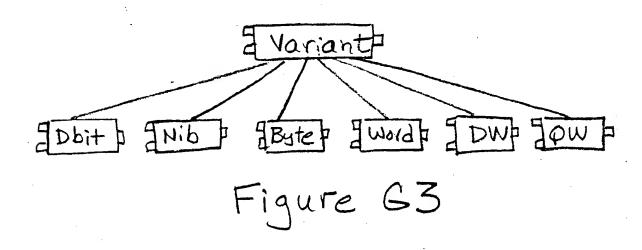
Word (16-bits)   Word ⊣|Word|⊢ Byte / Byte     Byte / Byte ⊣|Word|⊢ Word

Dword (32-bits)   Dword ⊣|DW|⊢ Word / Word     Word / Word ⊣|DW|⊢ Dword
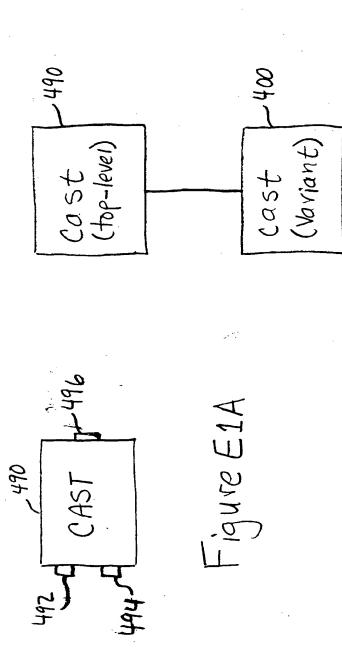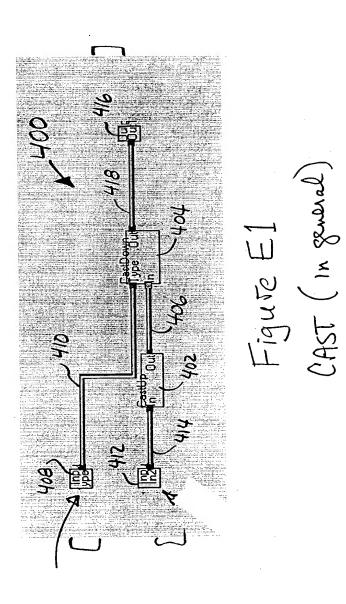
QWord (64-bits)   QWord ⊣|QW|⊢ Dword / Dword     Dword / Dword ⊣|QW|⊢ QWord

## Figure 61

Figure G2



Figure G3

600
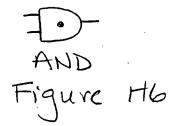
( Location, State )

ATOM

Figure H1

602

604

SOURCE

Figure H2

608

606

SINK

Figure H3

612

610

614

TRANSPORT

Figure H4

616

ASSIGNMENT

Figure H5

AND
Figure H6
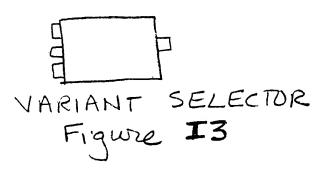
OR
Figure H7

INVERT
Figure H8

EXPOSER
Figure I1

COLLECTOR
Figure I2

VARIANT SELECTOR

Figure I3

COMPOSITE OBJECT

Figure I4

TRANSPORT JUNCTION

Figure I5

**Figure J-1**

# Menu Commands

**Figure J-2**

# File Menu

```
Viva 1.0
File  Edit  View  System  Help
    New Project              F2
    Open Project             F3
    Save Project             F4
    Save Project As          
    Save Project As Text     

    New Sheet                F5
    Duplicate Sheet          
    Open Sheet               F6
    Save Sheet As            F7

    Convert Sheet to Object  F8
    Delete Sheet             
    Play/Stop Sheet          F9

    Print                    
    Print Setup              

    Exit                     
```

**Figure J-3**

New Project

Open Project

Save Project

Save Project As

New Sheet

Duplicate Sheet

Open Sheet

Save Sheet As

Convert Sheet to Object

Delete Sheet

Play/Stop

Print

Print Setup

Exit                         Quits VIVA.

**Figure J-4**

# New Project Command



Viva 1.0

File  Edit  View  System  Help

| | | |
|---|---|---|
| New Project | F2 |
| Open Project | F3 |
| Save Project | F4 |
| Save Project As | |
| Save Project As Text | |
| New Sheet | F5 |
| Duplicate Sheet | |
| Open Sheet | F6 |
| Save Sheet As | F7 |
| Convert Sheet to Object | F8 |
| Delete Sheet | |
| Play/Stop Sheet | F9 |
| Print | |
| Print Setup | |
| Exit | |
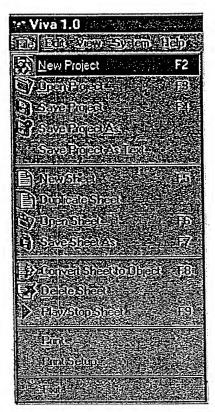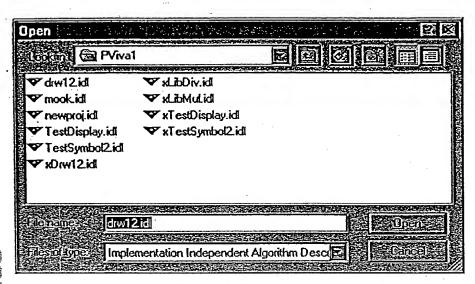
**Figure J-5**

# Open Project Command ▧

```
┌──────────────────────────────────────────────────────────────┐
│ Open                                              [?] [X]      │
│  Look in: [📁 PViva1          ▼] [⬆] [◻] [◻] [▦] [▤]          │
│  ▽ drw12.idl          ▽ xLibDiv.idl                           │
│  ▽ mook.idl           ▽ xLibMul.idl                           │
│  ▽ newproj.idl        ▽ xTestDisplay.idl                      │
│  ▽ TestDisplay.idl    ▽ xTestSymbol2.idl                      │
│  ▽ TestSymbol2.idl                                            │
│  ▽ xDrw12.idl                                                 │
│                                                               │
│  File name:    [drw12.idl                ]    [ Open  ]        │
│  Files of type: [Implementation Independent Algorithm Descr▼] [Cancel]│
└──────────────────────────────────────────────────────────────┘
```

**Figure J-6**

# Save Project Command 🖻

```
Viva 1.0
File  Edit  View  System  Help
   New Project...              F2
   Open Project...             F3
   Save Project                F4
   Save Project As...
   Save Project As Text...

   New Sheet                   F5
   Duplicate Sheet
   Open Sheet                  F6
   Save Sheet As               F7

   Convert Sheet to Object     F8
   Delete Sheet
   Play/Stop Sheet             F9

   Print
   Print Setup

   Exit
```

**Figure J-7**

# Save Project As Command



**Save As**

Save in: PViva1

| | |
|---|---|
| drw12.idl | xLibDiv.idl |
| mook.idl | xLibMul.idl |
| newproj.idl | xTestDisplay.idl |
| TestDisplay.idl | xTestSymbol2.idl |
| TestSymbol2.idl | |
| xDrw12.idl | |

File name: xTestDisplay.idl

Save as type: Implementation Independent Algorithm Desc

Save

Cancel
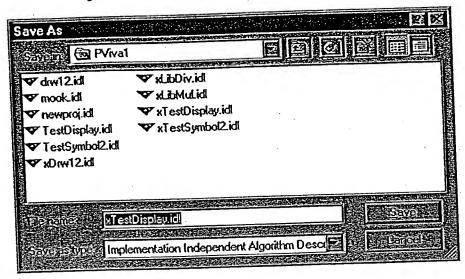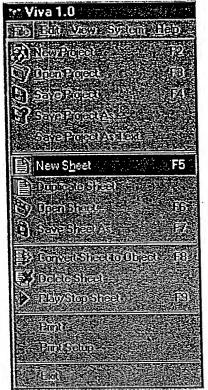
**Figure J-8**

# New Sheet Command

**Figure J-9**

# Duplicate Sheet Command



Viva 1.0

File  Edit  View  System  Help

New Project .......................... F2
Open Project ........................ F3
Save Project ........................ F4
Save Project As
Save Project As Text

New Sheet ........................... F5
**Duplicate Sheet**
Open Sheet ........................... F6
Save Sheet As ....................... F7

Convert Sheet to Object ....... F8
Delete Sheet
Play/Stop Sheet ................... F9

Print
Print Setup

Exit

**Figure J-10**

# Open Sheet Command



**Open**

Look in: PVival

| | |
|---|---|
| ALib.ipg | alib99.ipg |
| ALib0.ipg | mook.ipg |
| ALib1.ipg | TestAnd.ipg |
| alib2.ipg | testMUX.ipg |
| ALib3.ipg | thomLIB.ipg |
| ALib3a.ipg | thomMUX.ipg |

File name: TestAnd.ipg

Files of type: l2adl Page

Open

Cancel

**Figure J-11**
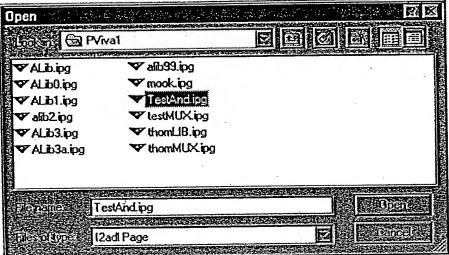
# Save Sheet As Command



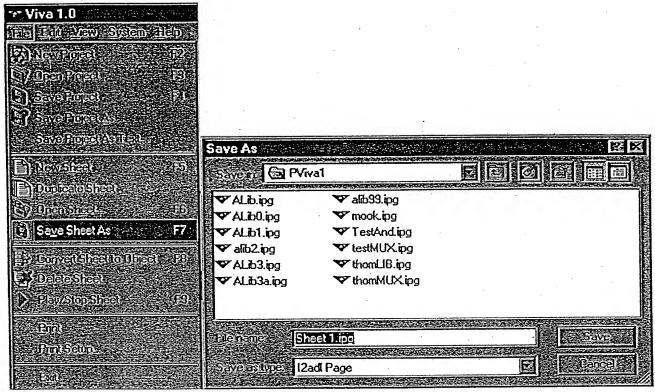Figure J-11 Save Sheet As Command dialog showing the Viva 1.0 File menu and the Save As dialog box.

**Figure J-12**

# Convert Sheet To Object Command

**Figure J-13**

Tree Group: | Composite Objects | ▾

## Delete Sheet Command

**Figure J-15**



Viva Error Message

Warning

Error Number    45

Message    Ok to close sheet without saving changes?
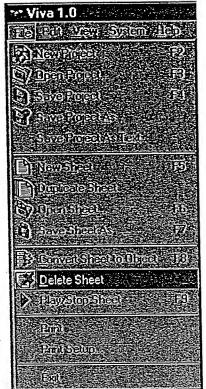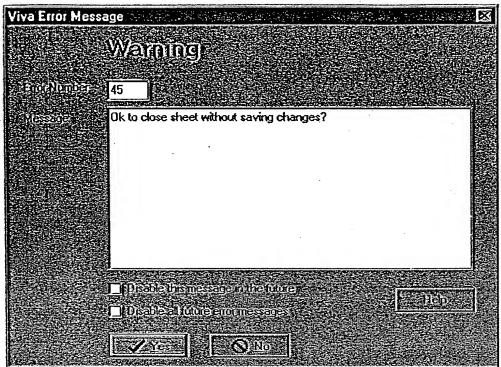
☐ Disable this message in the future
☐ Disable all future error messages

Help

✓ Yes    ⊘ No

**Figure J-16**

# Run Behavior Page ▶

```
Viva 1.0
File  Edit  View  System  Help
  New Project                    F2
  Open Project                   F3
  Save Project                   F4
  Save Project As...
  Save Project As Text...

  New Sheet                      F5
  Duplicate Sheet
  Open Sheet...                  F6
  Save Sheet As                  F7

  Convert Sheet to Object   F8
  Delete Sheet
▶ Play/Stop Sheet               F9

  Print...
  Print Setup

  Exit
```

## Print Command



Viva 1.0

File Edit View System Help

| | | |
|---|---|---|
| New Project | | F2 |
| Open Project | | F3 |
| Save Project | | F4 |
| Save Project As... | | |
| Save Project As Text | | |
| New Sheet | | F5 |
| Duplicate Sheet | | |
| Open Sheet | | F6 |
| Save Sheet As | | F7 |
| Convert Sheet to Object | | F8 |
| Delete Sheet | | |
| Play/Stop Sheet | | F9 |
| Print | | |
| Print Setup | | |
| Exit | | |

## Print Setup Command



Print Setup dialog box showing:

- **Printer**
  - Name: Brother HL-1240 series — Properties
  - Status: Default printer; Ready
- **Comment**
- **Paper**
  - Size: Letter 8 ½ x 11 in
  - Source: Paper Cassette
- **Orientation**
  - Portrait
  - Landscape
- OK / Cancel

**Figure J-19**

## Exit



```
Viva 1.0
File  Edit  View  System  Help

  New Project              F2
  Open Project...          F3
  Save Project             F4
  Save Project As
  Save Project As Text...

  New Sheet                F5
  Duplicate Sheet
  Open Sheet               F6
  Save Sheet As            F7

  Convert Sheet to Object  F8
  Delete Sheet
  Play/Stop Sheet          F9

  Print
  Print Setup...

  Exit
```

**Figure J-20**

## Edit Menu

**Figure J-21**

# View Menu
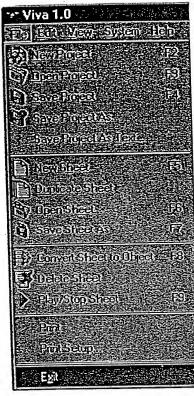


View Object Names      Displays the object name above each object.

View Node Names      Displays each node name instead of each node's icon.

View Nodes      Displays node colors on <u>Transports</u>. (Node colors correspond to data types).

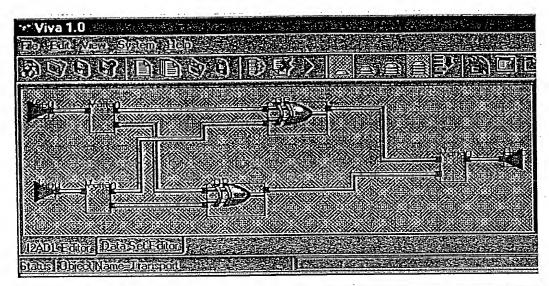Sort by Tree Group/Name      Sorts the Object Tree in alphabetical order.

Descend into Sheet      This displays the Behavior Page of the selected object. (This feature is also available by double-clicking on the object.)

**Figure J-22**

## View Object Names

**Figure J-23**

## View Node Names

**Figure J-24**

## View Nodes ▤
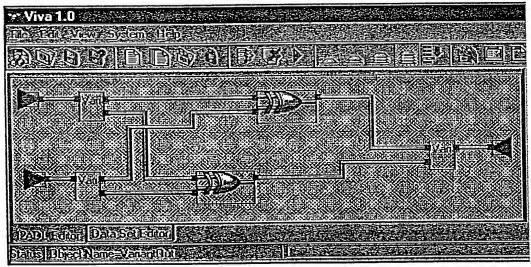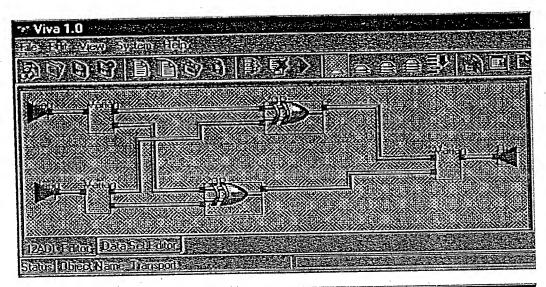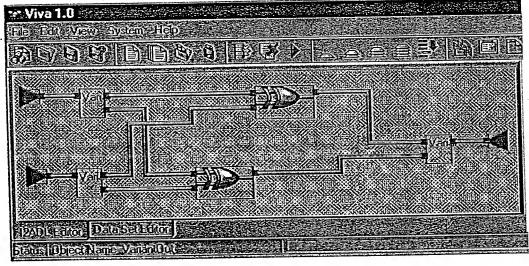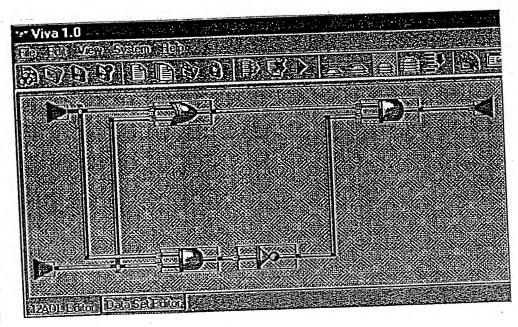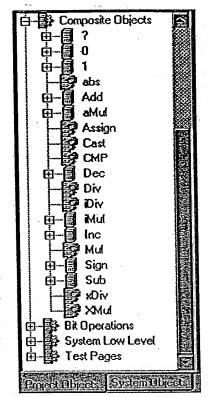
**Figure J-25**

## Sort by Tree Group/Name

```
Composite Objects
    ?
    0
    1
    abs
    Add
    aMul
    Assign
    Cast
    CMP
    Dec
    Div
    IDiv
    iMul
    Inc
    Mul
    Sign
    Sub
    xDiv
    XMul
Bit Operations
System Low Level
Test Pages
```

Project Objects   System Objects

## Descend Into Sheet

The Behavior Page of a VIVA Module can usually be displayed by either double clicking on the object, or by clicking on the descend icon ▣ after the Module has been selected using a left mouse click.

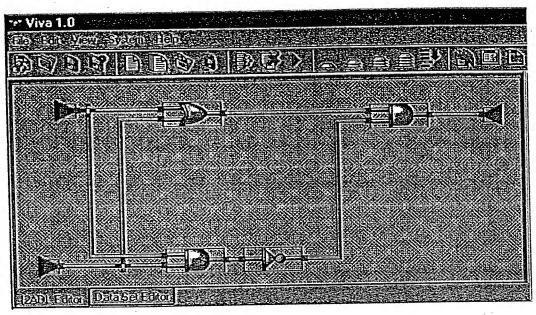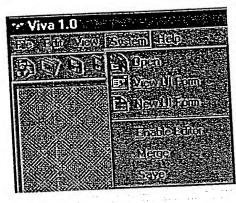The following is the Behavior Page for an Exclusive OR Module.

**Figure J-27**

# System Menu
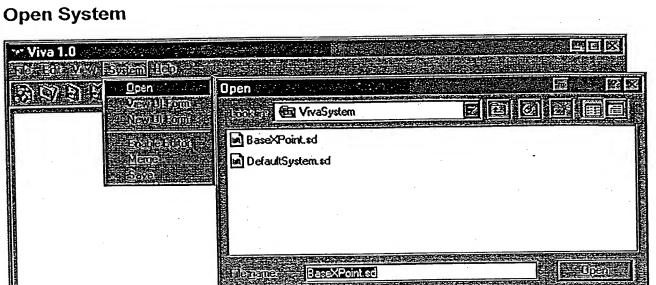


Open System  Select the target system (X86 or Floating Point Gate Array).

**Figure J-28**

## Open System



Viva 1.0

File Edit View System Help

Open
View UI Form
New UI Form

Delete UI Form
Merge
Save

Open

Look in: VivaSystem

BaseXPoint.sd
DefaultSystem.sd

File name: BaseXPoint.sd          Open

Files of type: System Description          Cancel

2ADL Editor   Data Set Editor
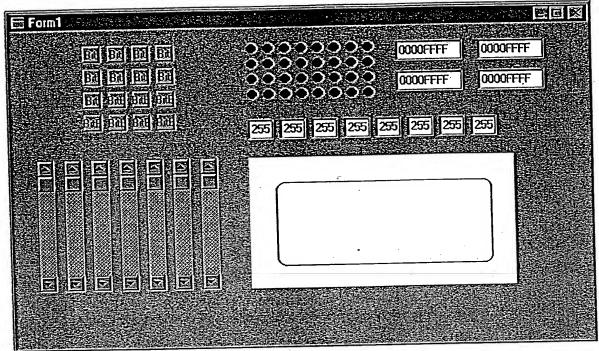
**Figure J-29**

# VIEW UI Form

**Figure J-30**

## NEW UI Form



Screenshot of Viva 1.0 application window with a menu open showing options: Open, View UI Form, New UI Form, Enable Editor, Merge, Save. An Open dialog box is displayed with Look in: VivaSystem, showing DefaultInterface.dll and DrawInterface.dll. File name field is empty, Files of type: VivaForms, with Open and Cancel buttons.

**Figure J-31**

## Help Menu

```
Viva 1.0
File  Edit  View  System  Help
                         Contents
                         Search for Help On
                         How to Use Help
                         About
```

**Figure J-32**

```
About VIVA
VIVA Version 1.0

Copyright (C) 07 Sep 2000 StarBridge Systems

Revision 0059

          OK
```

## ToolBar Controls

The Graphical User Interface of VIVA was designed to allow you to specify the desired behavior of the target computer environment.

### File Commands

New Project           Clears all objects, pages, and Modules.

Open Project           Load and display a VIVA project.

Save Project           Saves the current project.

Save Project As           Saves and renames the current project projects.

New Sheet           Creates a new blank sheet.

Duplicate Sheet           Duplicates the current sheet.

Open Sheet           Loads a sheet from a file.

Save Sheet As           Saves current sheet as a file.

Convert Sheet           Captures sheet behavior as a VIVA Module.

Delete Sheet           Erases and deletes current Behavior Page.

Run/Stop           Executes the behavior on the displayed Behavior Page.

### View Details

View Object Names           The names of the objects are displayed above the objects.

View Node Names           The names of the nodes of the objects are displayed instead of the object's icon.

View Nodes           The node colors are displayed on Transports. (Node colors correspond to data types.)

Sort by Tree Group/Name    Sorts the Object Tree in alphabetical order.

Descend into Sheet           Display the Behavior Page of the selected object (Also available by

double-clicking on the object.)

Open System                Selects the target system.

View UI Form               Displays the User Interface Form.
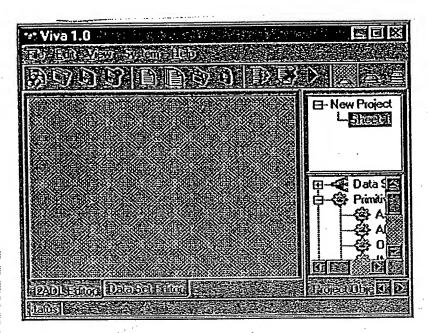
New UI Form                Allows you to Select a new User Interface Form.

**Figure J-34**

## DataSet Editor

**Figure J-35**
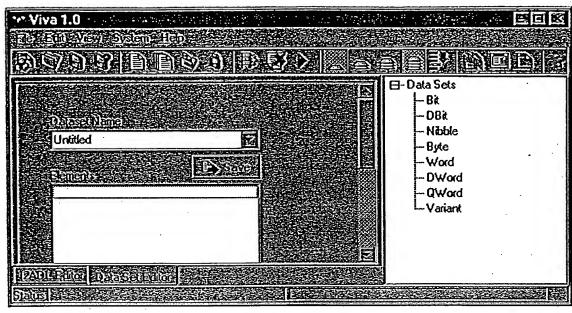


When done with defining the new data set, you press the Save Button

**Figure J-36**

# Edit Attributes Dialog

**Edit Attributes**

| Object Name: | And | | Tree Group: | Composite Objects |
|---|---|---|---|---|

**Attributes**

**Inputs**

| In2 | Variant |
|---|---|
| In1 | Variant |
| C | Bit |

**Outputs**

| C | Bit |
|---|---|
| Out2 | Variant |

**Attributes**

| | |
|---|---|

☐ View Control Nodes

[ OK ]  [ Cancel ]

**Documentation**

Generic polymorphic addition. Produces the correct result for unsigned integers, signed integers, and fixed point. The result is cast to the type of the lower input.

This module also produces the correct result for a mixture of signed and unsigned inputs.

# Constructing VIVA Modules

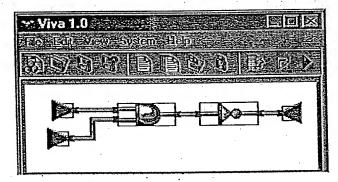### Figure J-37-1



### Figure J-37-2

**Figure J-38**

# Behavior Pages

**Figure J-38-1**

object with a left mouse click then click on the descend icon .

You execute a Behavior Page by clicking on the Run/Stop button  on the ToolBar.

**Figure J-38-2**



You make the connections or transports between the inputs, outputs, and intervening Modules by clicking on one node, moving the mouse to the connecting node, and then clicking again. (See Connecting Transports). If you have a preferred path, you can click the mouse at various points along the desired path.

Junctions are used when it is necessary to split a signal.

**Figure J-38-3**

Convert Sheet to Object command from the File Menu, or select the ToolBar icon, .

**Figure J-38-4**



This Module may now be used to construct other behavior pages for Modules with more complex behavior.

Node labels for the inputs and outputs of the NAND Module are the same labels on the inputs and outputs of the Behavior Page.
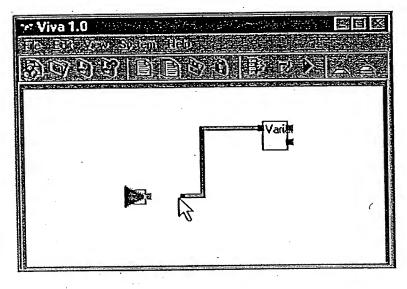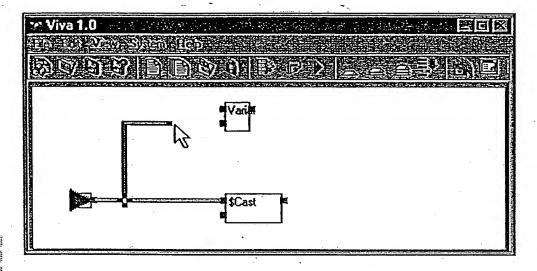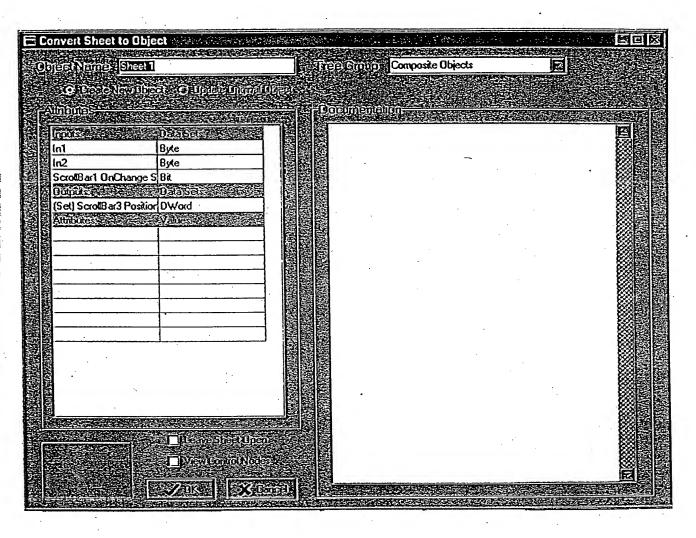
**Figure J-39**

## Connecting Transports

**Figure J-40**

## Connecting Junctions

**Figure J-41**

# Convert Sheet To Object Command 🔲

| Convert Sheet to Object | — □ ☒ |
|---|---|

**Object Name:** Sheet 1     **Tree Group:** Composite Objects

○ Create New Object   ◉ Update Original Object

**Attributes**

| Inputs | Data Set |
|---|---|
| In1 | Byte |
| In2 | Byte |
| ScrollBar1 OnChange S | Bit |
| **Outputs** | **Data Set** |
| (Set) ScrollBar3 Position | DWord |
| **Attributes** | **Values** |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

**Documentation**

☐ Leave Sheet Open
☐ View Control Nodes

✓ OK    ✗ Cancel

**Figure J-42**

| Tree Group | Composite Objects | ▼ |

**Figure J-43**
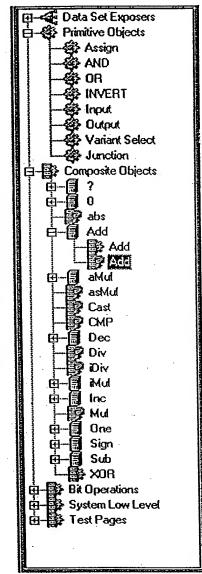
# Object Trees

**Figure J-44-1**

```
⊞ Data Set Exposers
⊟ Primitive Objects
      Assign
      AND
      OR
      INVERT
      Input
      Output
      Variant Select
      Junction
⊟ Composite Objects
   ⊞ ?
   ⊞ 0
      abs
   ⊟ Add
         Add
         Add
   ⊞ aMul
      asMul
      Cast
      CMP
   ⊞ Dec
      Div
      iDiv
   ⊞ iMul
   ⊞ Inc
      Mul
   ⊞ One
   ⊞ Sign
   ⊞ Sub
      XOR
⊞ Bit Operations
⊞ System Low Level
⊞ Test Pages
```

**Figure J-44-2**
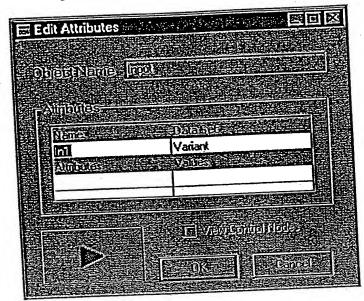
Figure J-45

# Modifying an Input

## Modifying an Output



Edit Attributes

Object Name: Output

Attributes:

| Name | Data Set |
|------|----------|
| Out1 | Variant |
| Attributes | Value |
|  |  |

View Control Node

OK    Cancel

## VIVA Constants

**Figure J-48**
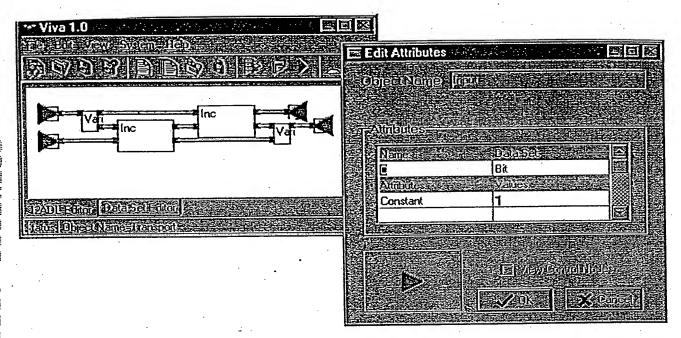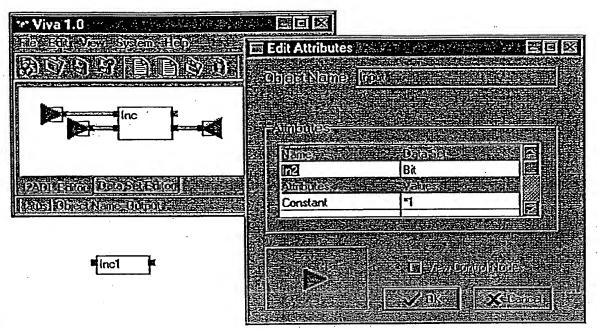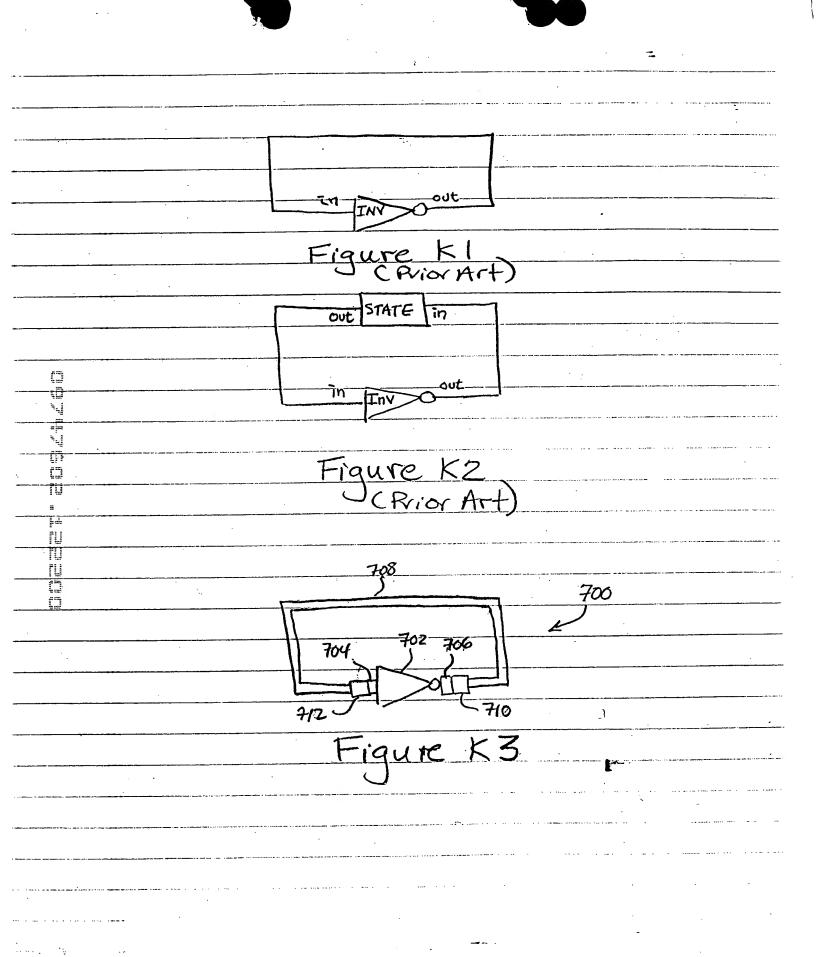
**Figure J-49**
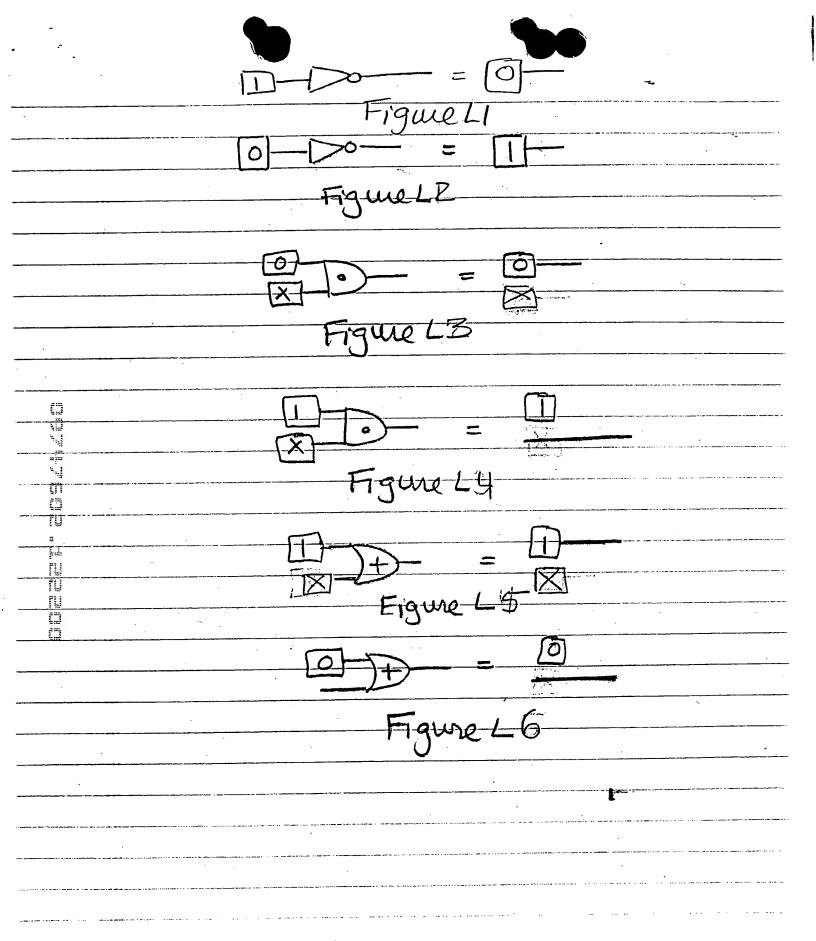
## Forcing GateWare Allocation

| Edit Attributes | | |
|---|---|---|
| Object Name: OB | | Tree Group: Composite Objects |

**Attributes**

**Documentation**

| Inputs: | |
|---|---|
| In1 | Variant |
| In2 | Variant |
| **Outputs:** | |
| Out1 | Variant |
| **Attributes:** | |
| ChildAttribute | "System=XPoint" |

☐ View Control Nodes

OK    Cancel

in    out
INV

**Figure K1**
(Prior Art)

out | STATE | in

in    out
Inv

**Figure K2**
(Prior Art)

708

700

704   702   706

712    710

**Figure K3**

$$1 \rightarrow \triangleright\!\circ \;-\; = \; \boxed{0} \;-$$

Figure L1

$$\boxed{0} \rightarrow \triangleright\!\circ \;-\; = \; \boxed{1} \;-$$

Figure L2

$$\boxed{0},\; \boxed{X} \;\text{AND}\; \bullet \;-\; = \; \boxed{0},\; \boxtimes$$

Figure L3

$$\boxed{1},\; \boxed{X} \;\text{AND}\; \bullet \;-\; = \; \boxed{1}$$

Figure L4

$$\boxed{1},\; \boxtimes \;\text{OR}\; + \;-\; = \; \boxed{1},\; \boxtimes$$

Figure L5

$$\boxed{0} \;\text{OR}\; + \;-\; = \; \boxed{0}$$

Figure L6

Figure L7



Figure L8



Figure L9



Figure L10

250

A $DS_4 \Rightarrow$     A     A=B — bit

B $DS_4 \Rightarrow$     B     A>B — bit

                   A<B — bit

Figure L10

Figure L11

Figure L12

Figure L13

740

COMPOSITE
OBJECT

744

746

Figure M1

742

756   760

750   754

Exp

obj.

Col

752

758

Exp

obj

Col

748

762

Figure M2

742

756

750 746
746

Exp. Obj. Col.

760

744

748

Exp. Obj. Col.

762

758

Figure M3

780

Insert "9"

Figure N1

Col.

1

0

Col.

0

Col.

782

4-bit

1

Figure N2

Figure 01



Figure 02



Figure 03

| Carry | | 1 | | 0 | | 1 | | |
|---|---|---|---|---|---|---|---|---|
| A | | 1 | 1 | 0 | 1 | 1 | 0 | |
| B | | 1 | 0 | 0 | 0 | 1 | 0 | |
| SUM | 1 | 0 | 1 | 1 | 0 | 0 0 | | |

## 2- bit Serial add
## Figure P1

| Carry | 1 | 0 | 0 | 1 | 1 | 0 |
|---|---|---|---|---|---|---|
| A | 1 | 1 | 0 | 1 | 1 | 0 |
| B | 1 | 0 | 0 | 0 | 1 | 0 |
| Sum | 1 | 0 | 1 | 1 | 0 | 0 | 0 |

## 1 - bit Serial add

## Figure P2

Figure P3

Serial ADD

Figure P4

Data Shared output

TYPE
IN2

Figure P5

Figure P7